

REMARKS

Claims 1 and 3-7, as amended, remain herein.

Claim 1 has been amended to recite a plasma-processing method for forming a mirror-like first surface on an object (see the specification at page 5, line 1), providing an apparatus including an electrode located in the processing chamber and facing the mounting unit, the electrode having a hole opening towards the mounting unit (see the specification at page 3 and Fig. 1). Claim 1 has further been amended to recite generating a plasma by blowing a plasma-generating gas from the hole (see the specification at page 5, lines 3-6 and page 6, lines 13-15), and reciting the limitations of claim 2, now cancelled. Claim 1 has further been amended to recite removing at least one reaction product from the first surface of an object by the blown plasma-generating gas simultaneously with the etching of the first surface of such object (see the specification at page 7, line 26 to page 8, line 5).

Minor edits for clarity have been made to claims 3-5 and 7.

Claim 2 has been cancelled without prejudice or disclaimer.

1. Claims 1 and 2 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite because "blowing" allegedly is unclear, and upon entry into the chamber, plasma-generating gas allegedly would circulate around the surface to be etched, and allegedly blow against the object to be etched. Applicants respectfully disagree for the following reasons.

Claim 1 recites an electrode having a hole therein and opening towards the mounting unit, and the method comprises generating a plasma by blowing a plasma-generating gas from the hole to the first surface of an object and by causing a plasma discharge by applying a high frequency voltage between the mounting unit holding the object and the electrode of the apparatus. Thus, a person skilled in the art of the presently claimed invention would understand the term "blowing" to be the normally accepted meaning of the word as applied to energetically moving gas from the hole in the electrode toward the object on the mounting unit, wherein electrical structures between the object and the electrode are recited for generating a plasma from the blown gas. See above herein for pertinent citations in the specification.

Moreover, contrary to the suggestion in the Office Action, there is no disclosure or teaching in the prior art of record stating or suggesting that mere circulating plasma-generating gas would impact the etched surface with a force strong enough to remove reaction products from the etched surface. Even if mere circulating gas were considered to be the same as "blowing", there is no teaching in the prior art suggesting that it would be either beneficial or desirable to energize such circulating gas to the extent that it impacts the etched surface with a force sufficient to remove reaction products. The only place in the present record describing compelling incoming plasma-generating gas to have such an effect is in applicants' claims and disclosure.

The Office Action alleges that claim 2 is indefinite because the word "opposite" lacks positional meaning. Claim 1 recites the limitations of now cancelled claim 2, reciting an electrode having a hole therein and opening towards the mounting unit (thereby deleting the word "opposite").

Reconsideration and withdrawal of the rejection are respectfully requested.

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2. Claims 1-3, 6 and 7 were rejected under 35 U.S.C. §102(b) over Cohen et al. U.S. Patent 6,110,836.

The presently claimed plasma-processing method comprises

(1) "providing an apparatus" including a process chamber, a mounting unit located in the processing chamber and for mounting an object on the mounting unit, and an electrode located in the processing chamber and facing the mounting unit, the electrode having a hole located therein, the hole opening towards the mounting unit; (2) "generating a plasma" by blowing a plasma-generating gas from the hole to the first surface of such object and by causing a plasma discharge by applying a high frequency voltage between the mounting unit and the electrode of the apparatus; and (3) "removing at least one reaction product" from the first surface of such object by the blown plasma-generating gas simultaneously with etching of the first surface of such object. This method is nowhere disclosed or suggested in the cited reference.

The Office Action cites Cohen et al. '836 as allegedly disclosing blowing plasma-generating gas against the object, thereby forming reaction products, and allegedly causing removal of reaction products from the surface of the object by plasma-generating gas. Actually, Cohen et al. '836 does not disclose

(1) providing the specific apparatus recited in applicants'

claim 1, (2) blowing of the plasma-generating gas in such apparatus, and (3) removing a reaction product by the blown gas.

The preamble of applicants' claim 1 recites a "method for forming a mirror-like first surface on an object," and further recites structure and an associated method for achieving such a polished surface. Cohen et al. '836 does not disclose structure and a method that can form a mirror-like surface, because Cohen et al. '836 does not disclose or suggest applicants' two steps: "removing" and "etching," which are performed simultaneously.

Only the presently claimed invention has the method and associated structure for making a surface of an object mirror-like, that is, removing the reaction product by fast moving gas (i.e., "blown gas") simultaneous with etching the surface of the object. In fact, Cohen et al. '836 describes a method for achieving the opposite effect. Cohen et al. '836, column 4, lines 15-19, describes:

The relative amount of reactive halogen-containing gas such as nitrogen trifluoride is kept low, generally below about 20 percent, to maintain a low etch rate and to prevent removal of more material than is necessary to remove the native oxide (underlining added).

Thus, Cohen et al. '836 does not mention obtaining the mirror-like surface recited in applicants' claim 1 and instead, discusses preventing removal, which is contrary to

removing sufficient material to produce a mirror-like surface. Cohen et al. '836 says "prevent(ing) removal of more material than is necessary to remove the native oxide" (quoted herein above), but does not say that such removal could possibly result in a polished surface. A person skilled in the art would not have any reason to understand that mere removal of native oxide would accomplish such polishing. The Cohen et al. '836 structure and method are not suitable for forming such a polished surface, which is the claimed result in applicants' claim 1. Cohen et al. '836 does not disclose or even suggest "removing said at least one reaction product ... simultaneously to said etching of the first surface of the object," as recited in applicants' claim 1.

Regarding the word "simultaneously," the Office Action in paragraph 6A refers to "removing said at least one reaction product from a surface of the object being etched by blowing the plasma-generating gas simultaneously while the etching the object" in claim 1 (underlining added). Claim 1 has been amended to delete the phrase "being etched" so that the phrase "by blowing" refers to "removing."

For the foregoing reasons, Cohen et al. '836 fails to disclose all elements of applicants' claimed invention, and

therefore is not a proper basis for rejection under §102. And, there is no disclosure or teaching in Cohen et al. '836 that would have suggested the desirability of modifying any portions thereof effectively to anticipate or suggest applicants' presently claimed invention. Claims 3-7, which depend from claim 1, are allowable for the same reasons described herein for claim 1. Accordingly, reconsideration and withdrawal of this rejection are respectfully requested.

3. Claim 4 was rejected under 35 U.S.C. §103(a) over Cohen et al. '836 and Yoshida et al. U.S. Patent 5,575,887.

The Office Action admits that Cohen et al. '836 does not disclose a protective sheet affixed to a first side of a wafer, and cites Yoshida '887 as teaching same. However, Yoshida et al. '887 does not provide the deficiencies of Cohen et al. '836 described herein.

For the foregoing reasons, neither Cohen et al. '836 nor Yoshida et al. '887 contains any teaching, suggestion, reason, motivation or incentive that would have led one of ordinary skill in the art to applicants' claimed invention. Nor is there any disclosure or teaching in either of these references that would have suggested the desirability of combining any portions thereof effectively to anticipate or suggest applicants'

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presently claimed invention. Accordingly, reconsideration and withdrawal of this rejection are respectfully requested.

4. Claim 5 was rejected under 35 U.S.C. §103(a) over Cohen et al. '836, Yoshida et al. '887 and Blalock et al. U.S. Patent 6,413,875.

The Office Action admits that Cohen et al. '836 and Yoshida et al. '887 do not disclose cooling of the mounting unit during the etching process, and cites Blalock et al. '875 for teaching same. However, Blalock et al. '875 does not provide the deficiencies of Cohen et al. '836 and Yoshida et al. '887 discussed herein.

All claims 1 and 3-7 are now proper in form and patentably distinguished over all grounds of rejection cited in the Office Action. Accordingly, allowance of all claims 1 and 3-7 is respectfully requested.


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Should the Examiner deem that any further action by the applicants would be desirable to place this application in even better condition for issue, the Examiner is requested to telephone applicants' undersigned representatives.

Respectfully submitted,

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